



General

Guideline Title

ACR Appropriateness Criteria® acute (nonlocalized) abdominal pain and fever or suspected abdominal abscess.

Bibliographic Source(s)

Yaghmai V, Rosen MP, Lalani T, Baker ME, Blake MA, Cash BD, Fidler JL, Greene FL, Hindman NM, Jones B, Katz DS, Kaur H, Miller FH, Qayyum A, Small WC, Sudakoff GS, Tulchinsky M, Yarmish GM, Yee J, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® acute (nonlocalized) abdominal pain and fever or suspected abdominal abscess. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 10 p. [97 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Grant TH, Rosen MP, Fidler JL, Gay SB, Greene FL, Huprich JE, Lalani T, Miller FH, Rockey DC, Sudakoff GS, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® acute abdominal pain and fever or suspected abdominal abscess. [online publication]. Reston (VA): American College of Radiology (ACR); 2008. 7 p.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Acute (Nonlocalized) Abdominal Pain and Fever or Suspected Abdominal Abscess

Variant 1: Postoperative patient with fever.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	8		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL* <input type="text"/>
			<input type="text"/>
US abdomen	6		O
MRI abdomen and pelvis without and with contrast	6	See statement regarding contrast in text under "Anticipated Exceptions."	O
X-ray abdomen	5	To evaluate for bowel perforation.	<input type="text"/> <input type="text"/>
MRI abdomen and pelvis without contrast	5		O
X-ray contrast enema	4		<input type="text"/> <input type="text"/> <input type="text"/>
Ga-67 scan abdomen	4		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
X-ray upper GI series with small bowel follow-through	4	Helpful when anastomotic leak is suspected.	<input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without and with contrast	3	May be helpful in select cases but should be used with caution because of increased radiation dose.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Tc-99m WBC scan abdomen and pelvis	3		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
In-111 WBC scan abdomen and pelvis	3		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Postoperative patient with persistent fever and no abscess seen on CT scan within the last 7 days.

Radiologic Procedure	Rating	Comments	RRL* <input type="text"/>
CT abdomen and pelvis with contrast	8		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative

Contrast Radiologic Procedure	Rating	Comments	RRL*
			<input type="text"/> <input type="text"/> <input type="text"/>
US abdomen	6		O
Tc-99m WBC scan abdomen and pelvis	6		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
In-111 WBC scan abdomen and pelvis	6		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
X-ray abdomen	5	To evaluate for bowel perforation.	<input type="text"/> <input type="text"/>
X-ray upper GI series with small bowel follow-through	5		<input type="text"/> <input type="text"/> <input type="text"/>
Ga-67 scan abdomen	5		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
MRI abdomen and pelvis without contrast	5		O
MRI abdomen and pelvis without and with contrast	5	See statement regarding contrast in text under "Anticipated Exceptions."	O
X-ray contrast enema	4		<input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without and with contrast	3	May be helpful in select cases but should be used with caution because of increased radiation dose.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Patient presenting with fever and no recent operation.

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis with contrast	8		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Radiologic Procedure	Rating	Comments	RRL*
CT abdomen and pelvis without contrast			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
US abdomen	6		O
X-ray abdomen	6	To evaluate for bowel perforation.	<input type="text"/> <input type="text"/>
MRI abdomen and pelvis without contrast	5		O
MRI abdomen and pelvis without and with contrast	5	See statement regarding contrast in text under "Anticipated Exceptions."	O
X-ray upper GI series with small bowel follow-through	4		<input type="text"/> <input type="text"/> <input type="text"/>
X-ray contrast enema	4		<input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without and with contrast	3	May be helpful in select cases but should be used with caution because of increased radiation dose.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Ga-67 scan abdomen	3		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Tc-99m WBC scan abdomen and pelvis	3		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
In-111 WBC scan abdomen and pelvis	3		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Pregnant patient.

Radiologic Procedure	Rating	Comments	RRL*
US abdomen	8		O
MRI abdomen and pelvis without contrast	7		O

Radioisotope and procedure	Rating	Notes	RRL*
CT abdomen and pelvis with contrast		Only if other studies without ionizing radiation have been utilized.	<input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without contrast	5		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
X-ray abdomen	4	To evaluate for bowel perforation.	<input type="text"/> <input type="text"/>
CT abdomen and pelvis without and with contrast	2	May be helpful in select cases but should be used with caution because of increased radiation dose.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
MRI abdomen and pelvis without and with contrast	2	Because it is unclear how gadolinium-based contrast agents will affect the fetus, these agents should be administered only with extreme caution. Gadolinium-based contrast agents are only recommended for use during pregnancy when there are no alternatives and benefit outweighs risk.	O
X-ray upper GI series with small bowel follow-through	2		<input type="text"/> <input type="text"/> <input type="text"/>
X-ray contrast enema	2		<input type="text"/> <input type="text"/> <input type="text"/>
Ga-67 scan abdomen	2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Tc-99m WBC scan abdomen and pelvis	2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
In-111 WBC scan abdomen and pelvis	2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Acute abdominal pain with fever raises clinical suspicion of an intra-abdominal abscess or other condition that may need immediate surgical or medical attention. Infection or other inflammatory conditions are the usual cause. In these circumstances, emergency imaging plays an important role, in conjunction with other clinical information, to make a quick and accurate diagnosis. This is crucial, as proper diagnosis facilitates expeditious and appropriate therapy, thus improving patient outcome. This discussion is limited to illnesses affecting the abdomen and pelvis and excludes the gynecologic and urinary tracts. Pediatric patients are not considered.

The range of pathology that can produce abdominal pain and fever with or without abscess is very broad. It includes pneumonia, hepatobiliary disease, complicated pancreatic processes, gastrointestinal (GI) perforation or inflammation, bowel obstruction or infarction, abscesses anywhere in the abdomen, and tumor—among others. Of all patients who present to the emergency department with abdominal pain, about one-third never have a diagnosis established, one-third have appendicitis, and one-third have some other documented pathology. In the "other" category, the most common causes include (in order of frequency): acute cholecystitis, small-bowel obstruction, pancreatitis, renal colic, perforated peptic ulcer, cancer, and diverticulitis. When fever is also present, the need for quick, definitive diagnosis is considerably heightened. Imaging may be especially helpful in the elderly with acute abdominal pain. In this population, many laboratory tests are nonspecific and may be normal despite serious infection.

Clinical Presentations

A variety of clinical presentations occur in patients with acute abdominal pain accompanied by fever. This review concentrates on the evaluation of patients with acute diffuse abdominal pain, immunocompromised patients with acute abdominal pain, and patients with suspected abdominal abscess. Other Appropriateness Criteria® topics address acute right upper quadrant pain, acute right lower quadrant pain, and acute left lower quadrant pain. Imaging evaluation varies slightly among patients with different clinical presentations.

Acute diffuse abdominal pain with fever can be caused by conditions that ordinarily instigate more localized pain. These conditions include complicated appendicitis, intestinal obstruction, complicated acute calculous or acalculous cholecystitis, bile duct obstruction with infectious cholangitis, hepatitis, hepatic abscess, pancreatitis with or without infection, pyelonephritis or renal infarction, renal stones, omental infarction, epiploic appendagitis, mesenteric adenitis, and diverticulitis. Other conditions that typically present with diffuse abdominal pain and fever include bowel ischemia or infarction, bowel perforation from ulcer or tumor, diffuse colitis, typhlitis and other GI infections, peritonitis, small-bowel inflammatory disease, abdominal abscess, intraperitoneal or retroperitoneal hemorrhage, vasculitis, pelvic inflammatory disease (PID), and diffuse malignancy.

In patients with intestinal ischemia, computed tomography (CT) is helpful for detecting vessel thrombosis, intramural or portal gas, and lack of bowel wall enhancement. A meta-analysis of the diagnostic accuracy of multidetector computed tomography (MDCT) for acute mesenteric ischemia has shown a pooled sensitivity of 93.3% and a pooled specificity of 95.9%. Reduced segmental bowel-wall enhancement has been shown to be 100% specific for segmental bowel ischemia, stressing the importance of intravenous (IV) contrast material administration in this setting. For intestinal infarction, CT (sensitivity 82%) considerably outperforms radiography plus ultrasound (US) (sensitivity 28%). In bowel perforation, while radiographs are sensitive to small volumes of free air, CT is more sensitive to even smaller volumes and can detect additional loculated air or air in the mesenteric root.

In patients with Crohn disease or inflammatory colitis, the presence of fever raises the possibility of associated abscess or phlegmon, although CT is the procedure of choice for diagnosing abscess, regardless of cause. Please refer to the National Guideline Clearinghouse (NGC) summary [ACR Appropriateness Criteria® Crohn disease](#) for further discussion. Pseudomembranous (i.e., *Clostridium difficile*) colitis may be accompanied with fever; CT findings are present in the colon in 88% of cases. Rarely, diffuse tumors such as lymphomas or metastases may present with abdominal pain and fever; again, CT is the procedure of choice due to its depiction of all abdominal organs and lymph node chains.

Neutropenic Patients

In neutropenic patients, abdominal pain remains a diagnostic challenge due to the lack of classic clinical and laboratory signs of intra-abdominal disease. Therefore, the diagnosis of acute abdomen may be delayed in these patients. Neutropenia is being encountered more commonly in clinical practice and may be due to cytotoxic chemotherapy or immunosuppressive therapy. Abdominal complications of neutropenia include *Clostridium difficile* colitis, cytomegalovirus (CMV) colitis, graft-versus-host disease, neutropenic enterocolitis, and bowel ischemia and perforation. Furthermore, acute abdomen may be due to the toxicity of chemotherapeutic agents. The liver and biliary tree may be involved with human immunodeficiency virus (HIV)-related cholangiopathy, hepatic abscesses, or hepatic bacillary angiomatosis, a peliosis-like condition. The spleen is subject to focal infarction or abscess. Bowel mucosal disease may include GI tuberculosis, CMV colitis, *Clostridium difficile* colitis, histoplasmosis, candida, *Mycobacterium avium* complex-related enteritis, and other opportunistic bowel infection (cryptosporidiosis, *Giardia*, *Isospora*, and *Strongyloides*). Tumors with adenopathy and bowel involvement include Kaposi's sarcoma and lymphoma of bowel, either of which may lead to bowel obstruction, pneumatosis intestinalis, perforation, or intussusception.

CT is the imaging procedure of choice to diagnose GI complications in immunocompromised patients. CT with oral, IV, and (frequently) rectal

contrast is almost always the procedure of choice in an HIV-positive patient with acute abdominal pain and fever. Supplemental barium studies of the mucosa of the stomach, small bowel, and colon may add additional information to that obtained from CT, particularly when mucosal lesions are small and fine. If there is any chance of bowel perforation, barium should not be used.

Occasionally, US of the biliary tree and gallbladder may be useful in evaluating HIV-related cholangiopathy. If CT is performed, radiographs have little incremental value. The utility of radionuclide scanning in this subgroup has not been validated in large prospective studies.

Abdominal Radiography

Conventional radiography may be performed in the setting of acute abdominal pain. Abdominal radiography, however, has a limited role in the evaluation of nontraumatic abdominal pain in adults. While it has been shown to have high sensitivity (90%) for detecting intra-abdominal foreign bodies and moderate sensitivity for detecting bowel obstruction (49%), its low sensitivity for sources of abdominal pain and fever or abscess limit its role in this setting. In a study of 874 patients who underwent abdominal radiography in a nontrauma emergency department, abdominal radiography was helpful in changing clinical management in only 4% of patients.

X-ray Upper Gastrointestinal Series with Small-Bowel Follow-Through and Contrast Enema

X-ray contrast studies of the GI tract have a limited role in the initial evaluation of adult patients without a history of recent surgery and with nonlocalized abdominal pain and fever. They may, however, be helpful in evaluating intestinal anastomotic leak, particularly when CT cannot be obtained or when there are equivocal findings on CT. The sensitivity of upper GI contrast examination for detecting leak after bariatric surgery varies among reports between 22% and 75%. Endoscopy is the preferred initial examination of the stomach and colon in patients suspected of having inflammatory bowel disease (IBD).

Ultrasound

US may be useful in selected conditions, including cholecystitis, cholangitis, liver abscess, diverticulitis, appendicitis, and small-bowel inflammation, where it may be used to assess activity of Crohn disease. While US may be able to depict portions of an abscess or malignancy (such as lymphoma), it is blind to many areas of the abdomen, particularly in the presence of increased bowel gas or free air. The shortcomings of US are partially offset by its lack of ionizing radiation, particularly in younger patients.

Computed Tomography

In general, CT is the most important modality in evaluating nonpregnant patients with abdominal pain, more so in those with fever. Several studies have shown that CT improves the final diagnosis and management of patients who present with abdominal pain. Two reports have found CT to be superior to clinical evaluation for finding the cause of abdominal pain. CT interpretation was correct in 90% to 96% of cases, while clinical evaluation was correct in 60% to 76% of cases. Additionally, the use of CT in patients with acute abdominal pain increases the emergency department clinician's level of certainty and reduces hospital admissions by 24%.

In a study of 584 emergency department patients presenting with nontraumatic abdominal pain, CT was shown to change the diagnosis, improve diagnostic certainty, and affect potential patient management decisions. In this study, CT was used to alter the leading diagnosis in 49% of the patients ($P < 0.00001$) and increased mean physician diagnostic certainty from 70.5% (pre-CT) to 92.2% (post-CT) ($P < 0.001$). The management plan was changed by CT in 42% of the patients ($P < 0.0001$). In a study of 93 emergency department patients, abdominal-pelvic CT with z-axis restriction based on patients' symptoms was shown to reduce radiation but included all acute pathology in only 33% of abnormal cases.

Abdominal CT has been shown to have an excellent interobserver agreement for specific urgent diagnoses such as diverticulitis (kappa value of 0.90), appendicitis (kappa value of 0.84), and bowel obstruction (kappa value of 0.81). The presence of an elevated white blood count (WBC) > 11.5 correlated with a positive abdominal CT, and the combination of WBC > 11.5 , male sex, and age < 25 years correlated with a diagnosis of appendicitis. Conversely, in a study of 522 young adult patients presenting to the emergency department with abdominal pain, no laboratory test was sufficient to offer reassurance that a CT is not necessary. Abdominal CT without the use of oral or IV contrast has been advocated as an alternative to abdominal radiographs for evaluating appendicitis. However, the use of contrast agents increases the spectrum of detectable pathology. Advances in CT technology have resulted in isotropic image acquisition. Multiplanar reformations have been shown to improve diagnostic confidence in patients with abdominal pain. Again, abdominal radiographs may provide useful information about bowel gas pattern or free air, but they offer no incremental information if CT is performed.

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) offers imaging without ionizing radiation. It has been shown to provide clinically useful information for rapid diagnosis of acute bowel pathology and the following gynecological emergencies: ovarian hemorrhage, ectopic pregnancy, tumor rupture, torsion, hemorrhage, infarction, and PID.

The role of nuclear medicine is limited in the evaluation of acute nonlocalized abdominal pain. While technetium-99m-labeled hexamethylpropyleneamine oxime (Tc-99m HMPAO) white-cell-labeled scanning has a high sensitivity for IBD (91%-98%) and may have some role in diagnosing appendicitis in older patients, it does not do as well as CT in depicting the complications of abscess and fistula.

Suspected Abdominal Abscess

Patients suspected of having abdominal abscesses may present in a number of ways: with fever, with diffuse or localized abdominal pain, or with a history of a condition that may predispose to abdominal abscesses, such as recent surgery and IBD, pancreatitis, etc. Imaging studies that have been used to detect abdominal abscesses include radiographs (supine and upright, and occasionally decubitus, views); nuclear medicine studies such as gallium-, indium-, or technetium-tagged leukocyte or fluorine-18-2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG-PET) studies; US; CT; and more recently MRI.

To the guideline panel's knowledge, there is little current information on radiography's role in detecting abdominal abscesses. Some reports suggest that radiographs may be useful, but this is far from proven. CT of the abdomen has been shown to be the first and best test for diagnosing intra-abdominal abscess in patients who have recently had abdominal surgery, and in patients with localizing signs for abscess. Among intensive care unit (ICU) patients with sepsis of unknown origin, CT of the abdomen and pelvis revealed the source of sepsis in 7 of 45 patients. The CT scan can be very helpful in determining whether a patient with pancreatitis has developed a pancreatic abscess, and it can be useful in detecting abscess formation in patients with diverticulitis or Crohn disease. Although CT scans can be quite accurate in detecting abnormalities of the psoas, the differentiation of psoas abscesses from other psoas lesions is difficult when only imaging criteria are used. In select cases, delayed CT images after the initial acquisition may help in differentiating an abscess from unopacified bowel loops or bladder or establishing extravasation of oral or IV contrast material.

US is often useful in specific cases, but when compared with CT, the results are usually of lower sensitivity and specificity. Gallium (Ga) scan and indium and technetium leukocyte scans are often useful when the CT scan is negative or equivocal. Nuclear scintigraphy permits whole-body imaging and the detection of sites of infection beyond the abdominal region. The literature on technetium-labeled leukocytes suggests a very high sensitivity and specificity for abdominal abscesses as well, although there are no adequate recent comparisons with CT. Although gallium is excreted in the GI tract, making it a poor choice for primary imaging of abdominal abscesses, among patients with persistent fever following colorectal surgery, the diagnostic accuracy for Ga-67 in detecting occult abscesses has been reported to be as high as 91.2% (compared to diagnostic accuracy of 97.1% for CT among the same patients).

FDG-PET and FDG-PET/CT are currently under investigation for evaluating infection and inflammation. They potentially could replace nuclear medicine studies such as gallium-, indium-, or technetium-tagged leukocyte studies. FDG-PET has several advantages over conventional nuclear medicine techniques, particularly in neutropenic patients, but its relative benefit in detection of abdominal abscess remains to be studied. MRI is an accurate examination for detecting abdominal and pelvic abscesses when the image acquisition is optimized for this purpose. Patients without previous surgery or with a low clinical suspicion of abscess are effectively evaluated with CT, and may also be studied with indium- or technetium-labeled leukocytes to search for infection or inflammation.

Recent literature has focused on the role of US and CT in percutaneous drainage of abdominal abscesses. Minimally invasive image-guided drainage of abdominal abscesses can produce excellent results. Endoscopic US has been proposed as an alternative approach for drainage of abdominal and pelvic abscess and infected necrosis; however, there are limited data to the guideline panel's knowledge comparing its performance with other modalities.

Abdominal Pain and Fever in Pregnant Patients

For discussion regarding evaluation of pregnant patients with right lower quadrant abdominal pain, see the NGC summary [ACR Appropriateness Criteria® right lower quadrant pain — suspected appendicitis](#). Diagnosing the source of abdominal pain in pregnancy is difficult for several reasons. Physiologic and anatomic changes that take place during pregnancy may lead to abdominal or pelvic symptoms that can mimic disease. These symptoms may accompany physiologic leukocytosis of pregnancy, further complicating accurate diagnosis. In pregnant patients with abdominal or pelvic pain, US should be the initial imaging modality because of its availability, portability, and lack of ionizing radiation.

MRI is being used more frequently in the evaluation of pregnant patients with abdominal pain who have had an inconclusive US examination. A survey of academic centers in the United States has shown that MRI is the preferred imaging modality for diagnosing appendicitis and abscess in pregnant patients in their first trimester. However, this survey showed that CT is more frequently used in the second and third trimesters of pregnancy to evaluate abdominal pain. In pregnant patients presenting with acute abdominal or pelvic pain, MRI has been shown to have excellent sensitivity and specificity for diagnosing appendicitis or other causes of abdominal and pelvic pain.

When CT is used to diagnose appendicitis, it has been shown to have a sensitivity of 88% to 100% for diagnosing appendicitis in pregnancy versus 33% to 46.1% for US. In a study of pregnant women with nontraumatic abdominal pain, CT established the diagnosis in 30% of these patients when US or clinical methods had failed, and had a 99% negative predictive value for appendicitis.

Summary

- In nonpregnant patients with acute nonlocalized abdominal pain and fever, CT with IV contrast is the imaging modality of choice.
- In pregnant patients, US and MRI are the initial imaging modalities of choice for evaluating nonlocalized abdominal pain and fever.
- A variety of clinical presentations occur in patients with acute abdominal pain accompanied by fever. In neutropenic patients, abdominal pain remains a diagnostic challenge due to the lack of classic clinical and laboratory signs.

Safety Considerations in Pregnant Patients

Imaging of the pregnant patient can be challenging, particularly with respect to minimizing radiation exposure and risk. For further information and guidance, see the following ACR documents:

- [ACR Practice Guideline for Imaging Pregnant or Potentially Pregnant Adolescents and Women with Ionizing Radiation](#)
- [ACR-ACOG-AIUM Practice Guideline for the Performance of Obstetrical Ultrasound](#)
- [ACR Manual on Contrast Media](#)
- [ACR Guidance Document for Safe MR Practices](#)

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m²), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m². For more information, please see the ACR Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- Ga, gallium
- GI, gastrointestinal
- In, indium
- MRI, magnetic resonance imaging
- Tc, technetium
- US, ultrasound
- WBC, white blood cell

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
<input type="text"/>	<0.1 mSv	<0.03 mSv
<input type="text"/> <input type="text"/>	0.1-1 mSv	0.03-0.3 mSv
<input type="text"/> <input type="text"/> <input type="text"/>	1-10 mSv	0.3-3 mSv
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	10-30 mSv	3-10 mSv
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a

number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as “Varies.”	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
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Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

- Acute nonlocalized abdominal pain and fever
- Abdominal abscess

Note: This guideline is limited to illnesses affecting the abdomen and pelvis and excludes the gynecologic and urinary tracts.

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Critical Care

Emergency Medicine

Family Practice

Gastroenterology

Infectious Diseases

Internal Medicine

Nuclear Medicine

Obstetrics and Gynecology

Radiology

Surgery

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for patients with acute nonlocalized abdominal pain and fever and/or suspected abdominal abscess

Target Population

Patients, including pregnant and immunocompromised patients, with acute abdominal pain and fever or suspected abdominal abscess

Note: Pediatric patients are not considered.

Interventions and Practices Considered

1. Computed tomography (CT) abdomen and pelvis
 - With contrast
 - Without contrast
 - Without and with contrast
2. Ultrasound (US) abdomen
3. Magnetic resonance imaging (MRI) abdomen and pelvis
 - Without and with contrast
 - Without contrast
4. X-ray
 - Abdomen
 - Upper gastrointestinal (GI) series with small bowel follow-through
 - Contrast enema
5. Nuclear medicine
 - Gallium (Ga)-67 scan abdomen
 - Technetium (Tc)-99m white blood cell (WBC) scan abdomen and pelvis
 - Indium (In)-111 WBC scan abdomen and pelvis

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis of acute abdominal pain

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis, and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid, but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to three rating rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for evaluation of patients with acute (nonlocalized) abdominal pain and fever or suspected

Potential Harms

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m²), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m². For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, an RRL indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Yaghmai V, Rosen MP, Lalani T, Baker ME, Blake MA, Cash BD, Fidler JL, Greene FL, Hindman NM, Jones B, Katz DS, Kaur H, Miller FH, Qayyum A, Small WC, Sudakoff GS, Tulchinsky M, Yarmish GM, Yee J, Expert Panel on Gastrointestinal Imaging. ACR Appropriateness Criteria® acute (nonlocalized) abdominal pain and fever or suspected abdominal abscess. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 10 p. [97 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

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Guideline Developer(s)

American College of Radiology - Medical Specialty Society

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Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Gastrointestinal Imaging

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

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Guideline Availability

Electronic copies: Available from the [American College of Radiology \(ACR\) Web site](#) .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#) .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria® acute (nonlocalized) abdominal pain and fever or suspected abdominal abscess. Evidence table. Reston (VA): American College of Radiology; 34 p. Electronic copies: Available from the [ACR Web site](#) .

Patient Resources

None available

NGC Status

This summary was completed by ECRI on March 19, 2001. The information was verified by the guideline developer on March 29, 2001. This NGC summary was updated by ECRI on August 17, 2006. This NGC summary was updated by ECRI Institute on June 2, 2010. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This summary was updated by ECRI Institute on September 19, 2012.

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